DETAILED ACTION

(1). Applicant's Request-for-Continued Examination (RCEX), Amendments and Remarks filed on 2/24/2010 have been received.

Claims 1 and 12 are amended.

The rejection for claims 1 and 12 in prior Office Action dated 9/24/2009 is revised in response to the Amendments and RCEX.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

(2). **Claims 1-2, 4-14** are rejected under under 35 U.S.C. 103(a) as obvious over Tran et al (US 6309532B1), evidenced by Dingman, Jr. et al (US 6071484A).

As to step of continuously circulating water through an essentially closed loop incorporating a gas scrubbing unit and an ion absorption unit comprising a water permeable ion absorbing means in a method for treatment of gaseous chemical waste in **independent claim 1**, Tran et al (US 6309532B1) disclose method and apparatus for capacitive deionization and electrochemical purification and regeneration of electrodes (Title). It relates to an electrochemical separation method and apparatus for removing ions, contaminants and impurities from water, fluids, and other aqueous process streams and for placing the removed ions into solution during the regeneration (Col. 1, line 26-30). By using the CDI separation system, it is now possible to remove organic and inorganic contaminants and impurities from liquid streams by the following physiochemical processes, the reversible electrostatic removal of organic and inorganic ions from water or any other dielectric solvent; the reversible or irreversible removal of any organic or inorganic impurities by any other adsorption process, including but not limited to underpotential metal deposition, chemi-sorption, and physic-sorption (Col. 37, line 7-17). More specific applications for CDI system and process include any application where the capacitive deionizer is used to assist a gas scrubbing column (Col. 37, line 24-26). As shown in the Figure 22, the anion exchange polymeric coating and cation exchange polymeric coating which read on the ion absorbing means. Tran et al **do not teach** the re-circulating water through an essentially

closed loop as claimed. however, it would have been obvious to have closed loop with gas scrubber and ion absorption unit in order to use the resource – purified water as evidenced by Dingman, Jr. et al (US 6071484A) in Figure 2, a closed loop scrubbing system is illustrated.

As to step of feeding exhaust gas or reaction product thereof to the gas scrubbing unit for dissolution in the circulating water thereby to form an aqueous solution containing ionic species derived from the exhaust gas in a method in **independent claim 1**, the gas scrubbing unit disclosed by Tran et al would inherently possess the features as claimed.

As to step of continuously bringing the circulating water into contact with ion absorbing means in the ion absorption unit while applying an electrical potential across the thickness of the ion absorbing means and removing from the ion absorbing unit a more concentrated aqueous solution of ion species in a method in **independent claim 1**, Tran et al (US 6309532B1) disclose Figure 22 which illustrates the features such as an electrical potential across the thickness of the ion absorbing means. Capacitive deionization can, for instance, produce a continuous flow of product water by operating two stacks of carbon aerogel electrodes in parallel. One stack purifies while the other is electrically and/or chemically regenerated (Col. 29, line 53-56). It would remove from the absorption unit a more concentrated aqueous solution of ionic species once the unit is in regeneration mode.

As to step of continuously adding to the closed loop a quantity of water corresponding to the quantity of aqueous solution of ionic species removed from the ion absorption unit in a method in **independent claim 1,** it would be obvious to have a quantity of water continuously adding to the loop because loss of water in regeneration mode, also for the purpose of continuous operation of the system.

<u>As to wherein the added water circulates through the ion absorption unit simultaneously when the electrical potential is applied to the ion absorbing means for removing from the ion absorption unit the new concentrated aqueous solution of the ion species</u> in **independent claim 1**, Tran et al (US 6309532B1) disclose that Fig. 7 illustrates a 2^{nd} embodiment of the capacitive deionization-regeneration system 175 using at least two parallel electrochemical cells 30A and 30B, both similar to the cell 30 shown in Fig.3. Of course, when more than two parallel cells are utilized, the operation is at phase differences other than 180°, for example, three parallel cells at 120°, etc. One of main advantages of the system175 is its ability to maintain a continuous

deionization and regeneration operations. The system 175 is generally similar to the system 11 and uses two cells 30A and 30B such that when one cell 30A or 30B is deionizing the fluid stream, the other cell is regenerating in the same manner as previously described herein, in preparation for the deionization, i.e., purification processs. Therefore, the operation of system 175 is cyclical and continuous (Col. 18, ln.58 – Col. 19, ln. 11). A controller 178 regulates a plurality of inflow and outflow valves 179, 180a, 180b, 180c, 181a, 181b, 181c, and 182, for controlling the flow of the fluid stream to and from the cells 30A and 30B (Col. 19, ln. 21-24). It would simultaneously adding water when removing more concentrated aqueous solution of ionic species as claimed.

As to an essential closed loop circulation system containing a gas scrubbing unit and an ion absorption unit comprising a water permeable ion absorbing means for enabling an electrical potential to be applied across the thickness of ion absorbing means in an apparatus for treating gaseous chemical waste in **independent claim 12**, the disclosure of Tran et al, Dingman, Jr. et al is incorporated herein by reference, the most subject matters as currently claimed, have been recited in Applicant's claim 1, and have been discussed therein.

As to a pump for continuously circulating water around the closed loop in **independent claim 12**, it would be obvious to have a pump for recirculation as evidenced by Dingman, Jr. et al in Figure 2 including a pump unit.

As to an inlet for exhaust gas or reaction product thereof into the gas scrubbing unit; an inlet for water into the closed loop circulation system; an outlet for concentrated aqueous solution of ionic species from ion absorption unit in **independent claim 12**, it would be obvious to have an inlet for exhaust gas into the gas scrubbing unit in order to scrub the gas. It also would be obvious to have inlet for water in circulation system in order to provide the water. As shown in Figure 22 of Tran et al the outflow which reads on the feature of instant claim.

As to a quantity of the concentrated aqueous solution removed from outlet is replenished by adding water into the closed loop circulation system in **independent claim 12**, the disclosure of Tran et al, Dingman, Jr. et al is incorporated herein by reference, the most subject matters as currently claimed, have been recited in Applicant's claim 1, and have been discussed therein.

<u>As to wherein the added water circulates through the ion absorption unit simultaneously when the electrical potential is applied to the ion absorbing means for removing from the ion</u>

absorption unit the concentrated aqueous solution of ionic species in **independent claim 12**, the disclosure of Tran et al is incorporated herein by reference, the most subject matters as currently claimed has been recited in Applicant's claim 1, and has been discussed therein.

(3). **Claims 2, 4-11, 13-14** under 35 U.S.C. 103(a) as obvious over Tran et al (US 6309532B1), evidenced by Dingman, Jr. et al (US 6071484A) for the same rationale recited in prior Office Action dated 9/24/2009.

(4). **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al (US 6309532B1) in view of Mir (US 6187162B1) for the same rationale recited in prior Office Action dated 9/24/2009.

(5). **Claim 15** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al (US 6309532B1) in view of Keller (US 5045291), as evidenced by Tomoi et al (US 5350523A) for the same rationale recited in prior Office Action dated 9/24/2009.

(6). **Claim 16** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al (US 6309532B1) in view of Yan (US 4795565) for the same rationale recited in prior Office Action dated 9/24/2009.

(7). **Claim 17** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al (US 6309532B1) in view of Yan (US 4795565), evidenced by Okada et al (US 4141828) for the same rationale recited in prior Office Action dated 9/24/2009.

Response to Arguments

Applicant's arguments with respect to claims 1 and 12 in regards to the simultaneously adding water when the electrical potential is applied to the ion absorbing means for removing from ion adsorption unit the concentrated aqueous solution of ionic species, have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IVES WU whose telephone number is (571)272-4245. The examiner can normally be reached on 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: Ives Wu
Art Unit: 1797
Date: June 16, 2010

/Duane Smith/
Supervisory Patent Examiner, Art Unit 1797